Team 47

NBA Part B and C Model Summary

Model Output:

Call:
lm(formula = Deal_Average_Salary ~ Age + G + FG + `3P` + `3PA` +
    FT + AST + TOV + `USG%` + DWS + RFA + Year_2017 + Year_2018 +
    Year_2019, data = train)

Residuals:
     Min   1Q   Median   3Q   Max
-14748095 -2419767   -42182 2239109 15496475

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 13179616   2377998   5.542 5.92e-08 ***
Age   -160108   57538 -2.783 0.005687 **
G   -156663   18419 -8.505 5.48e-16 ***
FG   33428   5167   6.469 3.35e-10 ***
`3P`   128665   30320   4.244 2.83e-05 ***
`3PA`   -42205   11854 -3.560 0.000422 ***
FT   31883   5348   5.961 6.16e-09 ***
AST   18114   3956   4.578 6.54e-06 ***
TOV   -53011   13706 -3.868 0.000131 ***
`USG%`   -196665   72044 -2.730 0.006661 **
DWS   2969460   361073   8.224 3.99e-15 ***
RFA   1856427   651826   2.848 0.004661 **
Year_2017   -1168183   640995 -1.822 0.069247 .
Year_2018   -2997216   631839 -4.744 3.07e-06 ***
Year_2019   -1858502   597253 -3.112 0.002014 **

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 4137000 on 347 degrees of freedom
Multiple R-squared: 0.7695, Adjusted R-squared: 0.7602
F-statistic: 82.76 on 14 and 347 DF, p-value: < 2.2e-16

Standardized Regression Coefficients:

 Age   G   FG   `3P`   `3PA`   FT
-0.08044765 -0.37323068 0.60216933 0.89526756 -0.75640152 0.31547398
 AST   TOV   `USG%`   DWS   RFA   Year_2017
 0.25560716 -0.32510020 -0.11568733 0.35340274 0.08014072 -0.05583556
 Year_2018 Year_2019
-0.14467574 -0.10023605

Predicted average yearly valuation for the three upcoming free unrestricted agents based on the model:

- Danny Glover: $22,256,528
- David Bowie: $16,447,223
- Mike Meyers: $14,670,416

Career Stats Comparison for the three upcoming free unrestricted agents:

Field goal success rate:
- Danny Glover: 42.7%
- David Bowie: 44.1%
- Mike Meyers: 43.2%

2-point field goal success rate:
- Danny Glover: 46.5%
- David Bowie: 52.6%
- Mike Meyers: 47.4%

3-point field goal success rate:
- Danny Glover: 38%
- David Bowie: 41.1%
- Mike Meyers: 36.7%

Effective field goal success rate:
- Danny Glover: 51.3%
- David Bowie: 59.4%
- Mike Meyers: 50.4%

Free throw success rate:
- Danny Glover: 87.3%
- David Bowie: 84.9%
- Mike Meyers: 75.9%

Offensive rebounds (game average):
- Danny Glover: 0.7
- David Bowie: 0.4
- Mike Meyers: 1

Assists (game average):
- Danny Glover: 2
- David Bowie: 1.1
- Mike Meyers: 1.5

Steals (game average):

- Danny Glover: 0.8
- David Bowie: 0.4
- Mike Meyers: 0.7

Points (game average):
- Danny Glover: 16.2
- David Bowie: 8
- Mike Meyers: 12.1

Model Summary:

This model used multiple linear regression with backwards-stepwise selection on the full linear model in order to determine which explanatory variables were most relevant in predicting a player's average deal salary per year. Additionally, three other variables were removed from the backwards-stepwise model because they had insignificant p-values. The final model resulted in the most relevant factors being age, games played, field goals, three-point field goals, three-point field goal attempts, free throws, assists, turnovers, usage percentage, defensive win shares, whether the player was a restricted free agent, and the year they were signed in.

From the correlation matrix, the three variables most correlated with deal average salary were points (PTS) at r = 0.7877658410, field goals (FG) at r = 0.7757720811, and win shares (WS) at r = 0.7737194360. Also, the three variables most correlated with each other were points (PTS), field goals (FG), and attempted field goals (FGA). The correlation between PTS and FG was r = 0.99090766, between PTS and FGA was r = 0.98574246, and between FG and FGA was r = 0.98182235. This indicated that even though points and field goals may be relevant in predicting deal average salary, including them in the model might provide redundant information. Similarly, defensive win shares, which was included in the final model, may capture some other aspect of how deal average salary was calculated that would not be captured by the win shares variable.

If a variable's p-value is less than 0.05, it means that it is relevant in predicting the deal average salary. Every variable except for one level in the factored year variable, 2017, had a significant p-value, which indicated that each variable was relevant to predicting deal average salary.

The residuals showed the median was relatively close to zero compared to the scale of the residuals. Additionally the distance between the first quartile and third quartile as well as the minimum and maximum were not that far apart. This indicated that the model did not tend to bias results either positively or negatively.

The residual standard error was 4,137,000, which was lower than the residual standard error of the full linear model of 4,188,000. The Adjusted R-Squared, which is the percentage of variation

that is explained by the model while considering the number of predictor variables was 0.7602, which was higher than the Adjusted R-Squared of the full linear model of 0.7543. This indicated that the final model was more accurate at predicting deal average salary than the full linear model.

Finally, the mean squared error, which is the square rooted average of the sum of the residuals for the final model, was 2,052,276. This was lower than the mean squared error of the full linear model at 3,456,272 and lower than the mean squared error of the LASSO regression model at 3,403,819. This further indicated that the final model was the most accurate at predicting deal average salary out of the three models tested.

If a variable's coefficient is positive, then a one unit increase in that variable is expected to have an increase in average salary by a factor of that coefficient; vice versa for negative coefficients. For example, a player being one year older is expected to decrease their deal average salary by $160,108.

From the standardized regression coefficients, we can see that the variables that had the largest influence on deal average salary were three-point field goals (positive at 0.89526756), three-point attempted field goals (negative at -0.75640152), and field goals (positive at 0.60216933) since their coefficients were the largest in absolute value.

Based on previous contracts the average yearly deal salary for the three players are
- Danny Glover: $65 million / 3 years = $21,666,667 per year
- David Bowie: $14 million / 2 years = $7,000,000 per year
- Mike Meyers: $15 million / 1 year = $15,000,000 per year

Given that our predicted valuations for Danny Glover and Mike Meyers are within $1 million of their previous average deal salaries, those two players were making close to their predicted worth. David Bowie, however, was making over $9 million less than our predicted valuation of him, so he was significantly underpaid.

Given that we have estimated that David Bowie is worth significantly more than he has historically been paid, he should be our top choice to pursue for the forward position.

Additionally, if Jerami Grant chooses to leave the team, the Denver Nuggets would be able to draft Mike Meyers as the small forward without passing the $26 million luxury tax threshold ($7 million from David Bowie's contract + $15 million from Mike Meyers' contract = $22 million). Drafting Danny Glover on the other hand, would certainly result in passing the luxury tax threshold as he is the most expensive of the three players ($7 million from David Bowie's contract + $21.666667 million from Danny Glover's contract = $28.666667 million). There is also no significant difference between the career stats that indicate offensive skills for Danny Glover and Mike Meyers. Given this, Mike Meyers would be our top choice for this potential opening.